

## CLAIMS

1. A printer for performing correction to improve the quality of images represented by input binary black and for printing the images,  
5 comprising an image-quality corrector unit for detecting second irregular patterns that are represented by data included in the input black and white pixel data and that are specific to an error-variance method, wherein said image-quality  
10 corrector unit detects at least one type of substantially vertical vertical-line irregular patterns, substantially horizontal horizontal-line irregular patterns, and thin-line patchy patterns to thereby smooth the detected second irregular  
15 patterns.

2. The printer according to claim 1, wherein said image-quality corrector unit sequentially inputs the black and white pixel data representing groups of an attention pixel and a plurality of  
20 peripheral pixels, and compares the input data to the irregular patterns registered; and when pattern-matching is detected, said image-quality corrector unit performs area gradation correction for converting an area at a predetermined position  
25 in an n-divisional pixel ( $n$  = natural number) of the attention pixel and a predetermined number of intrapixel divisional areas to black areas.

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3. A printer for performing correction to improve the quality of images represented by input binary black and for printing the images, comprising an image-quality corrector unit for  
5 detecting isolated pixels that are specific to error-variance method and that are represented by data included in the input black and white pixel data and for distributing the detected isolated pixel to peripheral pixels to thereby reduce the  
10 pixel size.

4. The printer according to claim 3, wherein said image-quality corrector unit comprises a plurality of matrix patterns having different sizes, uses the matrix patterns in the order of larger  
15 sizes to detect isolated pixels, and distributes the isolated pixels to peripheral pixels according to the sizes of the matrix patterns used to detect the isolated pixels.

5. The printer according to claim 4, wherein  
20 said image-quality corrector unit allows the number of distributed peripheral pixels to be increased in proportion to the increase in the size of the matrix pattern used to detect an isolated pixel, and concurrently, allows the size of a reduced  
25 distribution pixel to be reduced in inverse proportion thereto.

6. The printer according to claim 3, wherein

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said image-quality corrector unit uniformly distributes reduced pixels obtained through reduction in the size of the detected isolated pixel to peripheral pixels in a plurality of  
5 directions.

7. A printer for performing correction to improve the quality of images represented by input binary black and for printing the images, comprising:

10 a first image-quality corrector unit for detecting first irregular patterns that are represented by data included in the black and white pixel data and that are specific to binary processing (binary coding) according to a method  
15 other than an error-variance method to thereby smooth the detected first irregular patterns;

a second image-quality corrector unit for detecting second irregular patterns that are represented by data included in the input black and  
20 white pixel data and that are specific to an error-variance method, wherein said image-quality corrector unit detects at least one type of substantially vertical vertical-line irregular patterns, substantially horizontal horizontal-line  
25 irregular patterns, and thin-line patchy patterns to thereby smooth the detected second irregular patterns; and

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a controller unit for operating such that the black and white pixel data input to said first image-quality corrector unit is input to said second image-quality corrector unit to be processed

5 thereby when the black and white pixel data does not match one of the first irregularity detection patterns, and said first image-quality corrector unit is used to process the input black and white pixel data by interrupting processing being  
10 performed by said second image-quality corrector unit when the black and white pixel data matches one of the first irregularity detection patterns.

8. The printer according to claim 7, wherein said first image-quality corrector unit and said  
15 second image-quality corrector unit sequentially input the black and white pixel data representing groups of an attention pixel and a plurality of peripheral pixels, and compares the input data to the first irregular patterns and the second  
20 irregularity detection patterns; and when pattern-matching is detected, said first image-quality corrector unit and said second image-quality corrector unit perform area gradation correction for converting an area at a predetermined position  
25 in an n-divisional pixel ( $n$  = natural number) of the attention pixel and a predetermined number of intrapixel divisional areas to black areas.

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9. The printer according to claim 7, further comprising a third image-quality corrector unit for detecting isolated pixels that are specific to the error-variance method and that are represented by data included in the input black and white pixel data and for distributing the detected isolated pixel to peripheral pixels to thereby reduce the pixel size.

10. The printer according to claim 7, wherein said first image-quality corrector unit comprises a plurality of matrix patterns having different sizes, uses the matrix patterns in the order of larger sizes to detect isolated pixels, and distributes the isolated pixels to peripheral pixels according to the sizes of the matrix patterns used to detect the isolated pixels.

11. The printer according to claim 10, wherein said first image-quality corrector unit allows the number of distributed peripheral pixels to be increased in proportion to the increase in the size of the matrix pattern used to detect an isolated pixel, and concurrently, allows the size of a reduced distribution pixel to be reduced in inverse proportion thereto.

12. The printer as according to claim 7, wherein said image-quality corrector unit uniformly distributes reduced pixels obtained through

reduction in the size of the detected isolated pixel to peripheral pixels in a plurality of directions.

13. The printer according to claim 7,  
5 wherein said controller unit operates such that the black and white pixel data input to said first image-quality corrector unit is input to said second image-quality corrector unit and subsequently to said third image-quality corrector  
10 unit to be processed thereby when the black and white pixel data does not match one of the first irregularity detection patterns, and said first image-quality corrector unit is used to process the input black and white pixel data by interrupting  
15 processing being performed by said second image-quality corrector unit and processing being processed by said third image-quality corrector unit when the black and white pixel data matches one of the first irregularity detection patterns.

20 14. A printer for performing correction to improve the quality of images represented by input binary black and for printing the images, comprising:

a first image-quality corrector unit for  
25 detecting first irregular patterns that are represented by data included in the black and white pixel data and that are specific to a method other

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than an error-variance method to thereby smooth the detected first irregular patterns;

5 a third image-quality corrector unit for detecting isolated pixels that are represented by data included in the input black and white pixel data and for distributing the detected isolated pixel to peripheral pixels to thereby reduce the pixel size; and

10 a controller unit for operating such that the black and white pixel data input to said first image-quality corrector unit is input to said third image-quality corrector unit to be processed thereby when the black and white pixel data does not match one of the first irregularity detection patterns, and said first image-quality corrector unit is used to process the input black and white pixel data by interrupting processing being performed by said third image-quality corrector unit when the black and white pixel data matches  
15 one of the first irregularity detection patterns.  
20

15. A printing method for performing correction to improve the quality of images represented by input binary black and for printing the images, wherein detection is performed for  
25 second irregular patterns that are represented by data included in the input black and white pixel data and that are specific to an error-variance

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method such that detection is performed for at least one type of substantially vertical vertical-line irregular patterns, substantially horizontal horizontal-line irregular patterns, and thin-line patchy patterns to thereby smooth the detected second irregular patterns.

16. A printing method for performing correction to improve the quality of images represented by input binary black and for printing the images, wherein detection is performed for isolated pixels that are specific to error-variance method and that are represented by data included in the input black and white pixel data and for distributing the detected isolated pixel to peripheral pixels to thereby reduce the pixel size.

17. A printing method for performing correction to improve the quality of images represented by input binary black and for printing the images, comprising:

a first image-quality correction step for detecting first irregular patterns that are represented by data included in the black and white pixel data and that are specific to binary processing (binary coding) according to a method other than an error-variance method to thereby smooth the detected first irregular patterns;

a second image-quality correction step for



detecting second irregular patterns that are represented by data included in the input black and white pixel data and that are specific to an error-variance method, wherein said image-quality

5 correction step detects at least one type of substantially vertical vertical-line irregular patterns, substantially horizontal horizontal-line irregular patterns, and thin-line patchy patterns to thereby smooth the detected second irregular  
10 patterns; and

a control step for operating such that the black and white pixel data input to said first image-quality correction step is input to said second image-quality correction step to be  
15 processed thereby when the black and white pixel data does not match one of the first irregularity detection patterns, and said first image-quality correction step is used to process the input black and white pixel data by interrupting processing  
20 being performed in said second image-quality correction step when the black and white pixel data matches one of the first irregularity detection patterns.

18. A printing method for performing  
25 correction to improve the quality of images represented by input binary black and for printing the images, comprising:

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5 a first image-quality correction step for detecting first irregular patterns that are represented by data included in the black and white pixel data and that are specific to a method other than an error-variance method to thereby smooth the detected first irregular patterns;

10 a second image-quality correction step for detecting second irregular patterns that are represented by data included in the input black and white pixel data and that are specific to an error-variance method, wherein said image-quality correction step detects at least one type of substantially vertical vertical-line irregular patterns, substantially horizontal horizontal-line irregular patterns, and thin-line patchy patterns to thereby smooth the detected second irregular patterns;

20 a third image-quality correction step for detecting isolated pixels that are represented by data included in the input black and white pixel data and for distributing the detected isolated pixel to peripheral pixels to thereby reduce the pixel size; and

25 a control step for operating such that the black and white pixel data input to said first image-quality correction step is input to said third image-quality correction step to be processed

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a control step for operating such that the black and white pixel data input to said image-

quality correction step is input to said pixel-distribution step to be processed therein when the black and white pixel data does not match one of the first irregularity detection patterns, and said  
5 image-quality correction step is used to process the input black and white pixel data by interrupting processing being performed in said pixel-distribution step when the black and white pixel data matches one of the first irregularity  
10 detection patterns.

20. A printer for performing correction to improve the quality of images represented by input binary black and for printing the images, comprising:

15 a scale-varying processor unit for varying the size of an original image optically scanned to a predetermined image size by performing pixel-removal processing;

a binary unit for converting the size-varied  
20 image into black and white pixel data according to an error-variance method; and

an image-quality corrector unit for detecting irregular patterns that are represented by data included in the black and white pixel data and that  
25 are specific to an error-variance method, wherein said image-quality corrector unit detects at least one type of substantially vertical vertical-line

irregular patterns caused through the pixel-removal processing, substantially vertical vertical-edge irregular patterns, substantially horizontal horizontal-line irregular patterns, substantially horizontal horizontal-edge irregular patterns; and thin-line patchy patterns to thereby smooth the detected patterns. to thereby smooth the detected patterns.

21. The printer according to claim 20,  
10 wherein said scale-varying processor unit magnifies the size of the original image to a predetermined image size according to pixel-interpolation, and then reduces the magnified image size to the predetermined image size by performing the pixel-  
15 removal processing.

22. The printer according to claim 20,  
wherein said scale-varying processor unit detects a gradient variation of a pixel-removal-candidate attention pixel with respect to peripheral pixels,  
20 does not perform pixel-removal processing when the gradient variation is relatively great, and performs pixel-removal processing when the gradient variations are relatively small.

23. The printer according to claim 20,  
25 wherein said scale-varying processor unit defines a matrix having a predetermined size for a pixel-removal-candidate attention pixel, calculates the

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sum of absolute values representing the difference between the pixel-removal-candidate attention pixel and peripheral pixels belonging to the matrix as a gradient variation amount, does not perform the pixel-removal processing when the gradient variation amount is equal to or greater than a predetermined threshold, and performs pixel-removal processing when the gradient variation amount is less than the threshold.

10           24. The printer according to claim 20, wherein said scale-varying processor unit does not perform remove a removal-candidate pixel either when the level of the removal-candidate pixel is bright, and the overall tone of peripheral pixels  
15           thereof is dark; or when the level of the removal-candidate pixel is dark, and the overall tone of peripheral pixels thereof is bright.

          25. The printer according to claim 20, wherein said image-quality corrector unit inputs  
20           the black and white pixel data representing groups of an attention pixel and a plurality of peripheral pixels, and performs comparison of the input data to the irregular patterns registered; and when pattern-matching is detected, said image-quality  
25           corrector unit performs area gradation correction for converting an area at a predetermined position in an n-divisional pixel ( $n$  = natural number) of

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the attention pixel and a predetermined number of  
intrapixel divisional areas to black areas.

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